

Application No. 09/954,717
Response Dated June 9, 2005
Response to Office Action of January 31, 2005

Remarks/Arguments

Claims 1, 2, 4-13, 19-23, 38, and 45-60 are in the application. Claims 1, 19, 20, 38, 45, and 56 are in independent form. Claims 14-16, 27-33, and 42-44, which were withdrawn as directed to a non-elected invention are cancelled by this amendment.

Rejections under 35 USC § 102(b)

Claim 1, 2, 38, and 55 stand rejected under 35 USC § 102(b) as anticipated by U.S. Pat. No. 4,173,389 to Curtis ("Curtis"). Curtis describes a method of forming an optical fiber connector by molding a connector around an optical fiber. As shown in FIG. 2, the optical fiber 21 runs through the connector, from one end to the other. As described in col. 1, lines 35-36, "One approach that appears promising is to mold the connector body around the optical fiber."

Claim 1 recites "applying a formable material into the mold to form a waveguide between the first and second components, the waveguide forming an optical path between the first component and the second component, at least one of the first or second components including a laser or other active optical component."

A waveguide guides light or other electromagnetic radiation (such as microwaves). In Curtis, the waveguide is the optical fiber. The molded material is the connector body for mechanically connecting the fiber to another component; the light does not travel in Curtis's molded material, and the molded material is not a waveguide.

"Waveguide" is defined, for example, in a Glossary of Fiber Optic Terms at http://www.assemblymag.com/CDA/ArticleInformation/news/news_item/0.6501.98333.00.html as: "A structure that guides electromagnetic waves along its length. An optical fiber is an optical waveguide." Similarly, the Photonics dictionary at <http://www.photonics.com/dictionary/> defines "waveguide" as "A system or material designed to confine and direct electromagnetic waves in a direction determined by its physical boundaries." Wikipedia defines waveguide at http://en.wikipedia.org/wiki/Optical_waveguide as: "An optical waveguide is a form of a dielectric waveguide, that is capable of guiding an optical signal. The optical waveguide can be used as an component in integrated optical circuit or as a transmission medium in local or long

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haul communication systems. Optical waveguides can be classified according to their geometry (planar, strip or fiber waveguides), mode structure (single-mode, multi-mode), refractive index distribution (step or gradient index) and material (glass, polymer, semiconductor)."

When Curtis describes the properties of the mold material in col. 4, lines 27-42, Curtis does not mention optical properties because the molded connector serves a mechanical, not an optical function. As described above, Curtis teaches applying a formable material to form a mechanical connector for an optical fiber that guides light; the molded material is not a waveguide. Moreover, Curtis teaches forming a connector for an optical fiber and does not teach forming a waveguide forming an optical path between a laser or other active optical component as recited in claim 1.

Similarly, claim 38 recites: "inserting into the mold a formable light-carrying material, the light carrying material contacting the optical fiber and forming a light path to or from the optical fiber, the light path including two ends, a proximal end carrying light to or from the optical fiber" The molding material of Curtis is not a "light-carrying material" and the formable material does not "form a light path to or from the optical fiber." In Curtis, the optical fiber extends, and carries light, all the way through the formable material.

Claim 55 recites "applying a formable material into the mold to form a waveguide between the first and second components, the waveguide forming an optical path between the first component and the second component." As described above, the mold material of Curtis does not form a waveguide that forms an optical path.

Claims 45 and 51 stand rejected as anticipated by U.S. Pat. No. 5,308,555 to Blyler, Jr. et al. ("Blyler"). The process taught by Blyler has two molding steps. The first molding step entails creating the body of a splitter/combiner 700, and the second molding step entails forming a waveguide inside splitter/combiner 700 to connect four optical fibers. To create splitter/combiner 700, two optical fibers 104 and 105 are positioned on an optically flat substrate 101. FIG. 1. In region 108, the fibers are adjacent to each other form a splitter/combiner region in the final product. Epoxy fills the spaces below the fibers and, in region 108, the region between the two fibers. FIGS. 2 and 3. The sides of substrate 101 are enclosed, and a material is molded over top of the substrate and fibers 104 and 105 to form

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subassembly 400. Col. 3, lines 13-20. Substrate 101 and fibers 104 and 105 are removed to leave a molded subassembly 400 that includes grooves where fibers 104 and 105 and the epoxy had been. Thus, fibers 104 and 105 and substrate 101 do not form part of the final device; fibers 104 and 105 are only used as "plugs" to mold the grooves shown in FIGS 4, 5, and 6, and not as waveguides. A lid 701 is placed over the subassembly 400, and the grooves, now with roofs, become channels 702 and 703. FIG. 7. This completes the fabrication of the splitter/connector device 700.

To use splitter/combiner 700, a semi-liquid waveguide material is injected into grooves 702 and 703 and optical fibers 801-804 are inserted into the first part of the grooves, but not as far in as region 103. Col. 3, lines 39-62. The semi-liquid material fills region 103 and forms a waveguide that guides light among fibers 801-804. The embodiment shown in FIG. 9 is similar, but is made with two semicircular grooves, one in the cast upper subassembly and one in the cast lower subassembly, rather than a single U-shaped groove in the lower subassembly.

Thus, the first molding step of Blyler, which forms subassembly 400, does not form a waveguide. The second step, when the device is being used, forms a waveguide within splitter/combiner 700 to connect optical fibers 801, 802, 803, 804. The injected waveguide material hardens inside splitter/combiner 700 and is not removed. In fact, the inability to remove the waveguide is implied, not just by the waveguide's physical shape inside the splitter/combiner, but also by the statement that the injected material "also serves the purpose of an adhesive, optical fibers 801 through 804 are attached to splitter/combiner 700 by the outer coating of these fibers." Col. 4, lines 4-7.

Claim 45 includes the step of "removing the waveguide from the precision mold." As described above, the formed waveguide material is not removed from splitter/combiner 700, and the molded subassembly 400 is not a waveguide. Thus, Blyler does not teach the invention of claims 41 or 45.

In response to applicants' previous arguments, the Examiner states that Blyler teaches removing the waveguide in Blyler's claim 1, col. 5, lines 36-41. In that claim, Blyler casts a mold of the optical fibers 104 and 105 and then removes the optical fibers to leave the mold. While the Examiner is correct that an optical fiber is a waveguide, optical fibers 104 and 105 are

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used as plugs for making the mold, and are not used as waveguides. Moreover, claim 45 recites that the waveguide is formed in the precision mold, while the optical fibers 104 and 105 are placed onto substrate to form the mold, rather than the mold forming the optical fiber. Thus, optical fibers 104 and 105 are not formed by "inserting a formable material into the cavity of the precision mold" and "hardening the waveguide" as claimed. The actual waveguide in Blyler is formed by the semi-liquid optical material injected into splitter/combiner 700, and the waveguide is not removed.

Rejections under 35 USC § 103(a)

Claims 4-13 and 56-60 stand rejected under 35 USC 103(a) for obviousness over Curtis as applied to claim 1 above, in view U.S. Pat. No. 4,466,697 to Daniel ("Daniel").

Applicants submit that claims 4-13 and 56-60 are patentable for reasons described above with respect to claims 1, 2, 38, 45, 51 and 55. Claim 4 recites "removing the first component, the second component, and the waveguide from a mold used to form the waveguide by providing a support structure to support the first component, the second component, and the waveguide as it is removed." Daniel teaches fabricating an optical fiber by a conventional extrusion process (col. 4, lines 40-49), and including in the optical fiber material to scatter or reflect light. Daniels does not supply the elements from claim 1 missing from Curtis and neither does Daniel teach removing an active optical component from a mold used to form a waveguide to the optical component.

Claims 19-23 and 46-50 stand rejected under 35 USC 103(a) for obviousness over Blyler as applied to claim 1 above, in view Daniel.

Applicants submit that claims 19-23 and 46-50 are patentable over the combination for the reasons expressed above with respect to claims 1, 2, 38, 45, 51 and 55, as well as claims 4-13 and 56-60. Claim 19 recites forming a waveguide aligned with a component, and then applying a formable cladding material over the optical waveguide. As described above, Blyler forms a waveguide within splitter /combiner 701. Because the waveguide is formed inside splitter /combiner 701, one cannot then apply a formable cladding material over the waveguide. While Daniel described an optical fiber having a cladding, Daniel does not forming an optical waveguide aligned with an optical component and so does not provide the elements missing from

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Blyler.

Claims 52-54 stand rejected under 35 USC 103(a) for obviousness over Curtis as applied to claim 1 above, in view U.S. Pat. No. 5,389,312 to Lebby et al. (Lebby).

Lebby describes a method of fabricating a waveguide. Lebby teaches forming a waveguide first, and then attaching a component to the waveguide. Col. 5, lines 27-30, states: "Once passages 40' of cladding member 20' are filled and cured, the ends can be sawed at 50' and 52' to provide smooth polished ends." Filling passages 40' forms the waveguide. An optical device requiring an electrical is then positioned onto the rear face after it is sawed. Claim 53 recites using bumps to position a laser or other active optical device in a mold and then forming a waveguide between two components using a formable material.

Applicants submit that the application is allowable for reasons described above and respectfully requests reconsider and allowance.

Respectfully submitted,

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